IN THE CLAIMS

Please amend the claims as follows:

1. (Currently amended) A method of estimating a communication channel impulse response $h(t)$, comprising the steps of:

generating $co_m(t) = co(t + mNT_c)$ for $m = 0,1,\cdots,M$ by correlating a received signal $r(t)$ with a spreading sequence S_i of length N, wherein the received signal $r(t)$ comprises a chip sequence c_j applied to a communication channel characterizable by ~~an~~ the communication channel impulse response $h(t)$, and wherein the chip sequence c_j is generated from a data sequence d_i spread by the spreading sequence S_i, and wherein T_c is the chip period of the chip sequence c_j;

generating an estimated communication channel impulse response $\hat{h}_M(t)$ as a combination of $co_m(t)$ and d_m for $m = 0,1,\cdots,M$, where d_m is m-th symbol and M is number of symbols used to generate the estimated communication channel impulse response $\hat{h}_M(t)$; and

filtering the ~~first~~ estimated communication channel impulse response $\hat{h}_M(t)$ with a filter f to generate ~~the estimated~~ a filtered estimate of the communication channel impulse response $h(t)$, ~~with a~~ the filter f being selected at least in part according to the spreading sequence S_i.

2. (Original) The method of claim 1, wherein the filter f is further selected at least in part according to an autocorrelation $A(n)$ of the spreading sequence S_i.

3. (Currently amended) The method of claim 2, wherein the filter f is further selected at least in part according to the duration of ~~the impulse response of~~ the communication channel impulse response $h(t)$.

4. (Currently amended) The method of claim 2, wherein the filter f is further selected at least in part according to a zero-forcing criteria

$\sum_{i=-L}^{L}(A(n-i)\bullet f(i)) = A_f(n),\ -L \le n \le L$, wherein:

$f(i)$ is ~~the~~ an impulse response of the filter f such that $A_f(n)$ is a convolution of $A(n)$ and $f(i)$;

$A_f(n)=1$ for $n=0$ and $A_f(n)=0$ for $0<|n|\le L$; and

$A(n)=A(-n)=\sum_{i=o}^{N-1-n} S_i \bullet S_{i+n},\ 0 \le n \le N$ ~~, and N is a length of the chip sequence S_i~~.

5. (Original) The method of claim 4, wherein:

the parameter L is chosen such that a time duration of the impulse response of the communication channel $h(t)$ is less than LT_c.

6. (Original) The method of claim 4, wherein:

the parameter L is chosen such that a time duration of the impulse response of the communication channel $h(t)$ is approximately equal to LT_c.

7. (Original) The method of claim 1, wherein N is less than 20.

8. (Currently amended) The method of claim 1, wherein $M = $ 1 ~~0~~.

9. (Currently amended) The method of claim 1, wherein the data sequence d_i includes a constrained portion Cd_i associated with at least two codes w_0, w_1, wherein a correlation $A_{code}(k)$ of the constrained portion Cd_i with one of the codes w_0, w_1 is characterized by a maximum value at $k=0$ and less than maximum values at $k \neq 0$.

10. (Currently amended) The method of claim 1 ~~9~~, wherein the step of generating an estimated communication channel impulse response $\hat{h}_M(t)$ as a combination of $co_m(t)$

and d_m for $m = 0,1,\cdots,M$ comprises the step of computing $\hat{h}_M(t)$ as

$$\frac{1}{M}\sum_{m=0}^{M-1} d_m \bullet co(t + mNT_c).$$

11. (Original) The method of claim 10, wherein *M=2*.

12. (Original) The method of claim 9, wherein the data sequence d_i includes a preamble having a pseudorandom code including the constrained portion of the data sequence d_i.

13. (Original) The method of claim 9, wherein $A_{code}(k) = 1$ at $k = 0$ and $A_{code}(k) = 0$ for substantially all $k \neq 0$.

14. (Original) The method of claim 9, wherein $A_{code}(k) = 0$ for $0 < |k| \leq J$, wherein *J* is selected to minimize the correlation of the constrained portion Cd_i with the one of the codes w_0, w_1 for substantially all $k \neq 0$.

15. (Original) The method of claim 14, wherein *2J* is a length of the constrained portion Cd_i.

16. (Currently amended) The method of claim 9 ~~1~~, wherein $A_{code}(k) = 1$ at $k = 0$ and $\underline{A_{code}(k) \approx 0}$ ~~$A_{code}(k) = 0$~~ for substantially all $k \neq 0$.

17. (Currently amended) The method of claim 9 ~~1~~, wherein each of the at least two codes w_0, w_1 comprises two symbols.

18. (Currently amended) The method of claim 9 ~~1~~, wherein ~~the~~ each of the at least two codes w_0, w_1 comprises no more than two symbols.

19. (Currently amended) The method of claim 9 ~~1~~, wherein the codes w_0, w_1 comprise Walsh codes.

20. (Currently amended) An apparatus for estimating a communication channel impulse response $h(t)$, comprising:

means for generating $co_m(t) = co(t + mNT_c)$ for $m = 0,1,\cdots,M$ by correlating a received signal $r(t)$ with a spreading sequence S_i of length N, wherein the received signal $r(t)$ comprises a chip sequence c_j applied to a communication channel characterizable by ~~an~~ the communication channel impulse response $h(t)$, and wherein the chip sequence c_j is generated from a data sequence d_i spread by the spreading sequence S_i, and wherein T_c is the chip period of the chip sequence c_j;

means for generating an estimated communication channel impulse response $\hat{h}_M(t)$ as a combination of $co_m(t)$ and d_m for $m = 0,1,\cdots,M$, where d_m is m-th symbol and M is number of symbols used to generate the estimated communication channel impulse response $\hat{h}_M(t)$; and

a filter means f, selected at least in part according to the spreading sequence S_i, the filter means for filtering the ~~first~~ estimated communication channel impulse response $\hat{h}_M(t)$ to generate ~~the estimated~~ a filtered estimate of the communication channel impulse response $h(t)$ ~~with~~.

21. (Original) The apparatus of claim 20, wherein the filter means f is further selected at least in part according to an autocorrelation $A(n)$ of the spreading sequence S_i.

22. (Currently amended) The apparatus of claim 21, wherein the filter means f is further selected at least in part according to the duration of ~~the impulse response of~~ the communication channel impulse response $h(t)$.

23. (Currently amended) The apparatus of claim 21, wherein the filter means f is further selected at least in part according to a zero-forcing criteria

$$\sum_{i=-L}^{L}(A(n-i)\bullet f(i)) = A_f(n),\ -L \le n \le L,$$ wherein:

$f(i)$ is ~~the~~ an impulse response of the filter means f such that $A_f(n)$ is a convolution of $A(n)$ and $f(i)$;

$A_f(n) = 1$ for $n = 0$ and $A_f(n) = 0$ for $0 < |n| \le L$; and

$A(n) = A(-n) = \sum_{i=o}^{N-1-n} S_i \bullet S_{i+n},\ 0 \le n \le N$ ~~, and N is a length of the chip sequence S_i~~.

24. (Original) The apparatus of claim 23, wherein:

the parameter L is chosen such that a time duration of the impulse response of the communication channel $h(t)$ is less than LT_c.

25. (Original) The apparatus of claim 23, wherein:

the parameter L is chosen such that a time duration of the impulse response of the communication channel $h(t)$ is approximately equal to LT_c.

26. (Original) The apparatus of claim 20, wherein N is less than 20.

27. (Currently amended) The apparatus of claim 20, wherein M = 1 ~~0~~.

28. (Currently amended) The apparatus of claim 20, wherein the data sequence d_i includes a constrained portion Cd_i associated with at least two codes w_0, w_1, wherein a correlation $A_{code}(k)$ of the constrained portion Cd_i with one of the codes w_0, w_1 is characterized by a maximum value at $k = 0$ and less than maximum values at $k \ne 0$.

29. (Currently amended) The apparatus of claim 20 ~~28~~, wherein the means for generating an estimated communication channel impulse response $\hat{h}_M(t)$ as a combination of

$co_m(t)$ and d_m for $m = 0,1,\cdots,M$ comprises means for computing $\hat{h}_M(t)$ as $\frac{1}{M}\sum_{m=0}^{M-1} d_m \bullet co(t + mNT_c)$.

30. (Original) The apparatus of claim 29, wherein *M=2*.

31. (Original) The apparatus of claim 28, wherein the data sequence d_i includes a preamble having a pseudorandom code including the constrained portion of the data sequence d_i.

32. (Original) The apparatus of claim 28, wherein $A_{code}(k) = 1$ at $k = 0$ and $A_{code}(k) = 0$ for substantially all $k \neq 0$.

33. (Original) The apparatus of claim 28, wherein $A_{code}(k) = 0$ for $0 < |k| \leq J$, wherein *J* is selected to minimize the correlation of the constrained portion Cd_i with the one of the codes w_0, w_1 for substantially all $k \neq 0$.

34. (Original) The apparatus of claim 33, wherein *2J* is a length of the constrained portion Cd_i.

35. (Currently amended) The apparatus of claim 28 ~~20~~, wherein $A_{code}(k) = 1$ at $k = 0$ and $A_{code}(k) \approx 0$ ~~$A_{code}(k) = 0$~~ for substantially all $k \neq 0$.

36. (Currently amended) The apparatus of claim 28 ~~20~~, wherein each of the at least two codes w_0, w_1 comprises two symbols.

37. (Currently amended) The apparatus of claim 28 ~~20~~, wherein ~~the~~ each of the at least two codes w_0, w_1 comprises no more than two symbols.

38. (Currently amended) The apparatus of claim 28 ~~20~~, wherein the codes w_0, w_1 comprise Walsh codes.

39. (Currently amended) An apparatus for estimating a communication channel impulse response $h(t)$, comprising:

a correlator generating $co_m(t) = co(t + mNT_c)$ for $m = 0,1,\cdots,M$ by correlating a received signal $r(t)$ with a spreading sequence S_i of length N, wherein the received signal $r(t)$ comprises a chip sequence c_j applied to a communication channel characterizable by ~~an~~ the communication channel impulse response $h(t)$, and wherein the chip sequence c_j is generated from a data sequence d_i spread by the spreading sequence S_i, and wherein T_c is the chip period of the chip sequence c_j;

an estimator for generating an estimated communication channel impulse response $\hat{h}_M(t)$ as a combination of $co_m(t)$ and d_m for $m = 0,1,\cdots,M$, where d_m is m-th symbol and M is number of symbols used to generate the estimated communication channel impulse response $\hat{h}_M(t)$; and

a filter f selected at least in part according to the spreading sequence S_i, the filter for filtering the ~~first~~ estimated communication channel impulse response $\hat{h}_M(t)$ to generate ~~the estimated~~ a filtered estimate of the communication channel impulse response $h(t)$.

40. (Original) The apparatus of claim 39, wherein the filter f is further selected at least in part according to an autocorrelation $A(n)$ of the spreading sequence S_i.

41. (Currently amended) The apparatus of claim 40, wherein the filter f is further selected at least in part according to the duration of ~~the impulse response of~~ the communication channel impulse response $h(t)$.

42. (Currently amended) The apparatus of claim 40, wherein the filter f is further selected at least in part according to a zero-forcing criteria

$\sum_{i=-L}^{L}(A(n-i)\bullet f(i)) = A_f(n),\ -L \le n \le L$, wherein:

$f(i)$ is ~~the~~ an impulse response of the filter f such that $A_f(n)$ is a convolution of $A(n)$ and $f(i)$;

$A_f(n) = 1$ for $n = 0$ and $A_f(n) = 0$ for $0 < |n| \le L$; and

$A(n) = A(-n) = \sum_{i=o}^{N-1-n} S_i \bullet S_{i+n},\ 0 \le n \le N$ ~~, and N is a length of the chip sequence S_i~~.

43. (Original) The apparatus of claim 42, wherein:

the parameter L is chosen such that a time duration of the impulse response of the communication channel $h(t)$ is less than LT_c.

44. (Original) The apparatus of claim 42, wherein:

the parameter L is chosen such that a time duration of the impulse response of the communication channel $h(t)$ is approximately equal to LT_c.

45. (Original) The apparatus of claim 39, wherein N is less than 20.

46. (Currently amended) The apparatus of claim 39, wherein M = 1 ~~0~~.

47. (Currently amended) The apparatus of claim 39, wherein the data sequence d_i includes a constrained portion Cd_i associated with at least two codes w_0, w_1, wherein a correlation $A_{code}(k)$ of the constrained portion Cd_i with one of the codes w_0, w_1 is characterized by a maximum value at $k = 0$ and less than maximum values at $k \ne 0$.

48. (Currently amended) The apparatus of claim 39 ~~47~~, wherein the estimator for generating an estimated communication channel impulse response $\hat{h}_M(t)$ as a combination of

$co_m(t)$ and d_m for $m = 0,1,\cdots,M$ comprises means for computing $\hat{h}_M(t)$ as $\frac{1}{M}\sum_{m=0}^{M-1} d_m \bullet co(t + mNT_c)$.

49. (Original) The apparatus of claim 48, wherein *M=2*.

50. (Original) The apparatus of claim 47, wherein the data sequence d_i includes a preamble having a pseudorandom code including the constrained portion of the data sequence d_i.

51. (Original) The apparatus of claim 47, wherein $A_{code}(k) = 1$ at $k = 0$ and $A_{code}(k) = 0$ for substantially all $k \neq 0$.

52. (Original) The apparatus of claim 47, wherein $A_{code}(k) = 0$ for $0 < |k| \leq J$, wherein *J* is selected to minimize the correlation of the constrained portion Cd_i with the one of the codes w_0, w_1 for substantially all $k \neq 0$.

53. (Original) The apparatus of claim 52, wherein *2J* is a length of the constrained portion Cd_i.

54. (Currently amended) The apparatus of claim 47 ~~39~~, wherein $A_{code}(k) = 1$ at $k = 0$ and $A_{code}(k) \approx 0$ ~~$A_{code}(k) = 0$~~ for substantially all $k \neq 0$.

55. (Currently amended) The apparatus of claim 47 ~~39~~, wherein each of the at least two codes w_0, w_1 comprises two symbols.

56. (Currently amended) The apparatus of claim 47 ~~39~~, wherein ~~the~~ each of the at least two codes w_0, w_1 comprises no more than two symbols.

57. (Currently amended) The apparatus of claim 47 ~~39~~, wherein the codes w_0, w_1 comprise Walsh codes.

58. (New) A method of estimating a communication channel impulse response, comprising:

obtaining a received sequence via a communication channel, the received sequence comprising a chip sequence generated by spreading a data sequence with a spreading sequence;

generating a correlated sequence by correlating the received sequence with the spreading sequence;

generating an estimated communication channel impulse response based on the correlated sequence and a known portion of the data sequence; and

filtering the estimated communication channel impulse response based on a filter to obtain a filtered estimate of the communication channel impulse response, the filter being selected based on the spreading sequence.

59. (New) The method of claim 58, wherein the generating the estimated communication channel impulse response comprises

multiplying multiple data symbols in the known portion with the correlated sequence at multiple time offsets, and

generating the estimated communication channel impulse based on a sum of results of the multiplication.

60. (New) The method of claim 58, wherein the filter is selected such that convolution of an impulse response of the filter and an autocorrelation of the spreading sequence is non-zero at center of the autocorrelation and is zero for a predetermined range to the left and right of the center of the autocorrelation.

61. (New) The method of claim 58, wherein the spreading sequence is an 11-chip Barker sequence.

62. (New) The method of claim 58, wherein the known portion of the data sequence is selected such that correlation of the known portion with a code is characterized by a maximum value at one point in the known portion and less than maximum values at all other points in the known portion, and wherein the estimated communication channel impulse response is generated further based on the code.

63. (New) An apparatus for estimating a communication channel impulse response, comprising:

means for obtaining a received sequence via a communication channel, the received sequence comprising a chip sequence generated by spreading a data sequence with a spreading sequence;

means for generating a correlated sequence by correlating the received sequence with the spreading sequence;

means for generating an estimated communication channel impulse response based on the correlated sequence and a known portion of the data sequence; and

means for filtering the estimated communication channel impulse response based on a filter to obtain a filtered estimate of the communication channel impulse response, the filter being selected based on the spreading sequence.

64. (New) The apparatus of claim 63, wherein the means for generating the estimated communication channel impulse response comprises

means for multiplying multiple data symbols in the known portion with the correlated sequence at multiple time offsets, and

means for generating the estimated communication channel impulse based on a sum of results of the multiplication.

65. (New) The apparatus of claim 63, wherein the filter is selected such that convolution of an impulse response of the filter and an autocorrelation of the spreading sequence is non-zero at center of the autocorrelation and is zero for a predetermined range to the left and right of the center of the autocorrelation.

66. (New) The apparatus of claim 63, wherein the spreading sequence is an 11-chip Barker sequence.

67. (New) The apparatus of claim 63, wherein the known portion of the data sequence is selected such that correlation of the known portion with a code is characterized by a maximum value at one point in the known portion and less than maximum values at all other points in the known portion, and wherein the estimated communication channel impulse response is generated further based on the code.

68. (New) An apparatus for estimating a communication channel impulse response, comprising a processor configured

to obtain a received sequence via a communication channel, the received sequence comprising a chip sequence generated by spreading a data sequence with a spreading sequence;

to generate a correlated sequence by correlating the received sequence with the spreading sequence;

to generate an estimated communication channel impulse response based on the correlated sequence and a known portion of the data sequence; and

to filter the estimated communication channel impulse response based on a filter to obtain a filtered estimate of the communication channel impulse response, the filter being selected based on the spreading sequence.

69. (New) The apparatus of claim 68, wherein to generate the estimated communication channel impulse response, the processor is configured

to multiply multiple data symbols in the known portion with the correlated sequence at multiple time offsets, and

to generate the estimated communication channel impulse based on a sum of results of the multiplication.

70. (New) The apparatus of claim 68, wherein the filter is selected such that convolution of an impulse response of the filter and an autocorrelation of the spreading

sequence is non-zero at center of the autocorrelation and is zero for a predetermined range to the left and right of the center of the autocorrelation.

71. (New) The apparatus of claim 68, wherein the spreading sequence is an 11-chip Barker sequence.

72. (New) The apparatus of claim 68, wherein the known portion of the data sequence is selected such that correlation of the known portion with a code is characterized by a maximum value at one point in the known portion and less than maximum values at all other points in the known portion, and wherein the estimated communication channel impulse response is generated further based on the code.